



BELCHIM
C R O P P R O T E C T I O N

Research with TOUGH 600 EC. Improving control of kochia, wild mustard and v. canola in chickpea, lentil and field pea.

Nigel
Buffone
Soils And
Crops

10 March



Wild mustard



450 g ai/ha pyridate



600 g ai/ha pyridate

2400 ml/HA

Technical Specifications Metribuzin



Synergy

1 + 1 =



Colby's Equation

The equation: $E = (X*Y)/100,$

□ X and Y are the effects of the herbicides applied alone (expressed as p

The actual value for the herbicide mixture is then compared to the □ expected

□ If greater = synergism

□ If less than = antagonism

□ If equal = additive

Synergy – (PSII + PSII)

Science of Synergy

Photosystem II Herbicides (5,6,7)

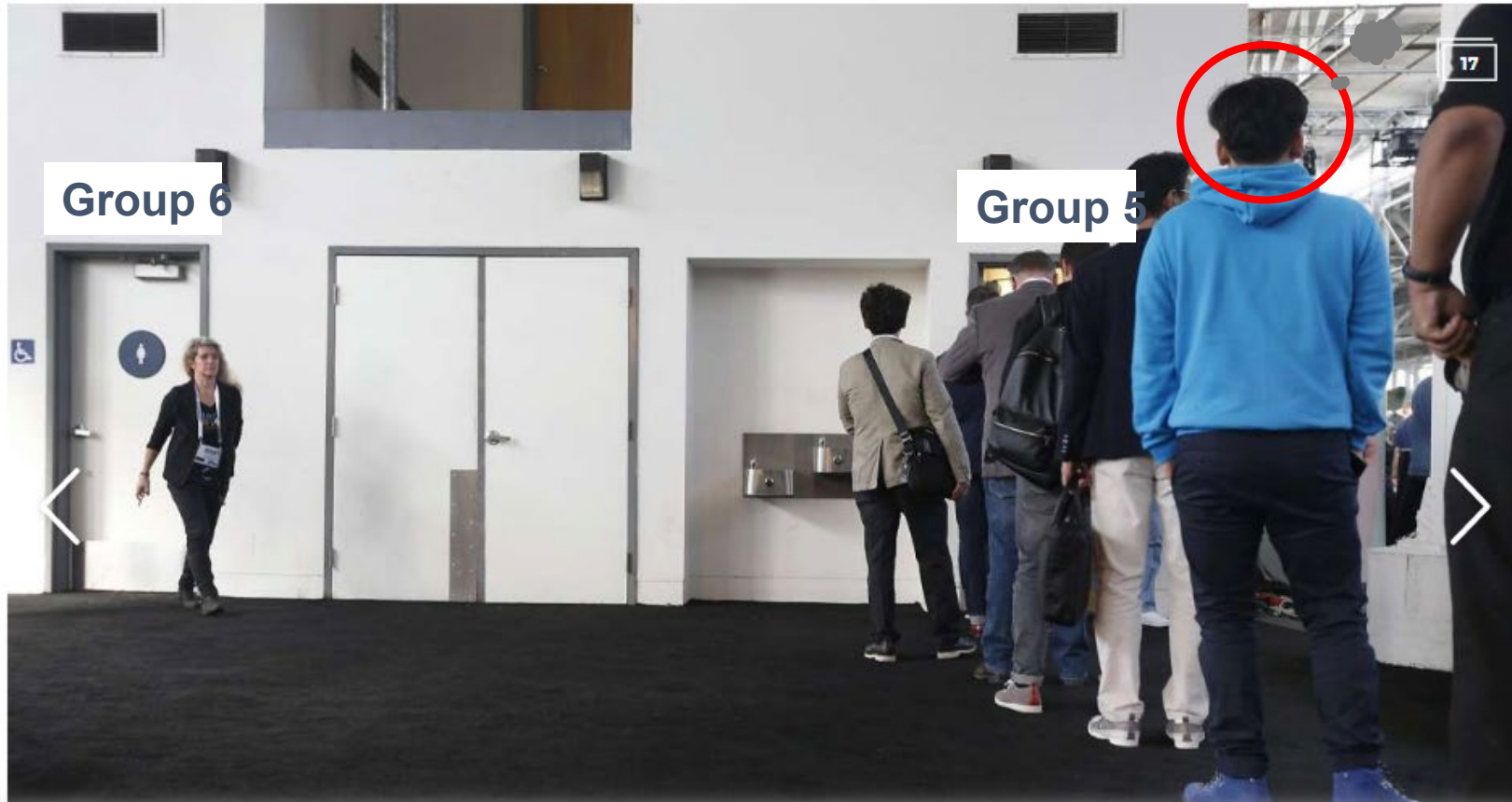
- > Groups 5,6 and 7 PSII herbicides occupy different Qb binding site niches on the D1 protein of the photosystem II complex in chloroplast thylakoid membrane
- > Displaces PQ preventing acceptance of 2 electrons passed along the ETC from Q_A to Q_B
- > Stops CO₂ fixation and NADPH production
- > Results in production of singlet oxygen/ROS and triplet chlorophyll – normally dissipated by carotenoids (overloaded from PSII herbicide)
- > Further chlorophyll and carotenoid destruction = cells and organelles dry and disintegrate rapidly

The Story that sums up Metribuzin's Efficacy



Amy Graff, SFGATE | Sep. 14, 2016 | Updated: Sep. 15, 2016 12:34 p.m.

I ain't got time for this



Growers Rejoice Over Better Weed Control When Using MMOEA

I Love Fire



I aint got time for this



Show Stopper!!!!

Synergy – (PSII + PSII)



Metribuzin 425 ml/ha (h



Pyridate 500 ml/ha + Metribuzin 425 ml/ha



Tough 600 EC 500 ml/ha

Synergy on W. Mustard

Treatment	Rate ml/HA	EQN	% Control 42 DAT
Metribuzin	209	X	52.3
TOUGH 600 EC	500	Y	63.4
TOUGH 600 EC Metribuzin	500 209	E	82.5
TOUGH 600 EC Metribuzin	500 209	Actual	94.9

Synergy on V. Canola

Treatment	Rate ml/HA	EQN	% Control 42 DAT
Metribuzin	209	X	52.4
TOUGH 600 EC	500	Y	62.5
TOUGH 600 EC Metribuzin	500 209	E	82.2
TOUGH 600 EC Metribuzin	500 209	Actual	92.5

Synergy on Lambs quarters

Treatment	Rate ml/HA	EQN	% Control 42 DAT
Metribuzin	209	X	62.6
TOUGH 600 EC	500	Y	57.6
TOUGH 600 EC Metribuzin	500 209	E	84.1
TOUGH 600 EC Metribuzin	500 209	Actual	99.7

Synergy on Kochia

Treatment	Rate ml/HA	EQN	% Control 42 DAT
Metribuzin	209	X	55 f
TOUGH 600 EC	500	Y	82.9 e
TOUGH 600 EC Metribuzin	500 209	E	93.9 cd
TOUGH 600 EC Metribuzin	500 209	Actual	99.4 ab



Summary

- Tough 600 EC is a group 6 contact herbicide for use in chickpea, lentils and field peas
- The combination of PSII inhibitors of different groups results in synergistic interactions that increase efficacy and consistency
- Tough 600 EC, when combined with metribuzin, provides control through **MMOEA** and synergistic interactions on
 - Kochia
 - W. Mustard
 - V. Canola
 - Lambs Quarters
- Please see me/email me if you have any questions

Thanks for your Attention!

Contact Information

- Email: nigel.buffone@Belchim.com
- Cell: 519-280-5747